PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

ADVANCED Resear

THE DEPARTMENT OF ENERGY COMBUSTION AND ENVIRONMENTAL RESEARCH FACILITY

PRIMARY PROJECT PARTNER

U.S. Department of Energy
Office of Fossil Energy
Pittsburgh, PA

MAIN SITE

Pittsburgh, PA

TOTAL ESTIMATED COST

$5,550,000

COST SHARING

DOE	**$4,050,000**
Non-DOE	**$1,500,000**

Project Description

New technologies that hold the key to clean, efficient power production from the Nation's abundant coal supplies are emerging from government and industry laboratories across the country.

To give the Nation's researchers a user facility to study these innovations before committing millions of dollars to commercial scale-up, DOE's Office of Fossil Energy has established the Combustion and Environmental Research Facility. Commissioned in 1989 at the Department's field center in Pittsburgh, the highly instrumented, automated facility is equipped to conduct a wide range of fundamental and applied research. It can fire most solid, liquid, or gaseous fuels, including renewable and waste fuels.

For example, the facility's test equipment can evaluate how coal cleaned by advanced preparation processes performs in a combustor. It also can be used to evaluate innovative combustion devices, such as low-NOx burners, and post-combustion cleanup technologies for sulfur dioxide and nitrogen oxide pollutants. The facility also may be used as a test bed to support evaluation of advanced materials for use in emerging combustion technologies and to validate the performance of advanced diagnostic equipment.

The flexible facility is designed to replicate conditions found in full-scale utility and industrial boilers, yet it is sized at a pilot scale of about 35 pounds-per-hour of coal (500,000 Btu/hr). Thus it is a very cost-effective research facility.

Due also to its highly skilled technical and operating staff, the Combustion and Environmental Research Facility has become an ideal test center for government-industry technology transfer projects. Several Cooperative Research and Development Agreements (CRADAs)—arrangements that give private companies access to the capabilities of Federal laboratories—have been conducted at the facility.

The facility's versatile design has been duplicated by the Korea Institute of Energy Research and the Central Power Research Institute in India. Also, Bharat Heavy Electricals, Ltd. (India), based the design of its larger pilot-scale combustion research center on the Pittsburgh facility. The U.S. Bureau of Mines patterned its instrumentation for use in iron ore processing kilns on the equipment at the DOE facility.

Program Goal

The Department of Energy's Advanced Research Program recognizes that first-class fundamental and applied science are needed to advance United States global industrial competitiveness, clean energy research, national security, and environmental quality. Financial trends indicate a continuing need for risk-sharing by the Federal government in developing and demonstrating new, capital-intensive energy technologies. By providing the Nation's scientists with a state-of-the-art facility in which to test a wide range of research, the DOE Combustion and Environmental Research Facility helps to fulfill the mission of the Advanced Research Program.

The Department of Energy Combustion and Environmental Research Facility

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Project Partners

CONSOL Inc.
Pittsburgh, PA

Consolidated Natural Gas Company
Pittsburgh, PA

Energy Systems Associates
Pittsburgh, PA

Rocket Research Corporation
Redmond, WA

Reaction Engineering International
Salt Lake City, UT

U.S. Bureau of Mines
Minneapolis, MN

Project Benefits

The Combustion and Environmental Research Facility is one of several state-of-the-art user facilities available to government and industry researchers at DOE's Pittsburgh field center. The highly instrumented and automated facility was designed to replicate conditions found in full-scale utility and industrial boilers.

The facility's principal benefit is that it can be used during the development of a wide range of clean coal (or other fuel) technologies at a much lower cost than if testing were done in full-scale commercial facilities. Since its commissioning in 1989, several Cooperative Research and Development Agreements (CRADAs) have been performed in the facility:

- Consolidated Natural Gas Company of Pittsburgh, Pennsylvania, is conducting proof-of-concept tests of its patented iNOxulation process, which uses natural gas, and its combustion products which destroy nitrogen oxide (NOx) pollutants.
- In a joint effort, Consolidated Natural Gas and Energy Systems Associates of Pittsburgh developed and commercialized a patented pulsed natural gas reburning process, called Reducing Eddy Afterburn, to control NOx emissions from fossil fuel combustion.
- Rocket Research Corporation of Redmond, Washington, used the facility to follow up on earlier experiments to reduce NOx by injecting various radicals generated in a plasma torch.
- The facility is being used to evaluate the combustion properties of a coal from the North Slope of Alaska. Significant reserves of this coal exist, but only limited quantities are currently available for combustion evaluation. However, it has great potential as a high-quality boiler fuel for export to the Pacific Rim. Coal samples from Ukraine have also been evaluated in the facility as part of DOE support to the U.S. Agency for International Development (USAID).
- The unit has recently served as a test bed for evaluating the erosion and corrosion of ceramic and metal alloy materials that are being developed by industry and DOE National Laboratories.

From now into the next century, the use of coal will be challenged by more and more stringent environmental regulations. Clean coal technologies will be the key to meeting those challenges. The Combustion and Environmental Research Facility provides a critical link that can move technologies from research laboratories to the commercial marketplace.

Cost Profile (Dollars in Millions)

	Prior Investment	FY95	FY96	FY97	Future Funds
Department of Energy *	$2.0	$0.75	$0.7	$0.6	TBD
Private Sector Partners	$0.5	$0.35	$0.65	TBD**	TBD**

* Appropriated Funding
** Cost-sharing will depend on negotiations with private sector users of the facility.

Key Milestones